

Stress, Cortisol and Immunity

In today's lifestyle, we often hear about stress and its negative effects on the body. Disease and malfunction are widespread and rising. The proverb, "There is nothing new under the sun," tells a true tale. There has always been stress, but perhaps it shows up in different disguises today than for our ancestors. Also, the body's resources for coping with the stress may be more limited today.



MattGlover.com. Cartoon reflection: third-world sickness. Cartoons & Cartoonists, August 26th 2006. Retrieved Jan. 3rd 2010 from <http://www.mattglover.com/wordpress/wordpress/2006/08/25/cartoon-reflection-third-world-sickness/>

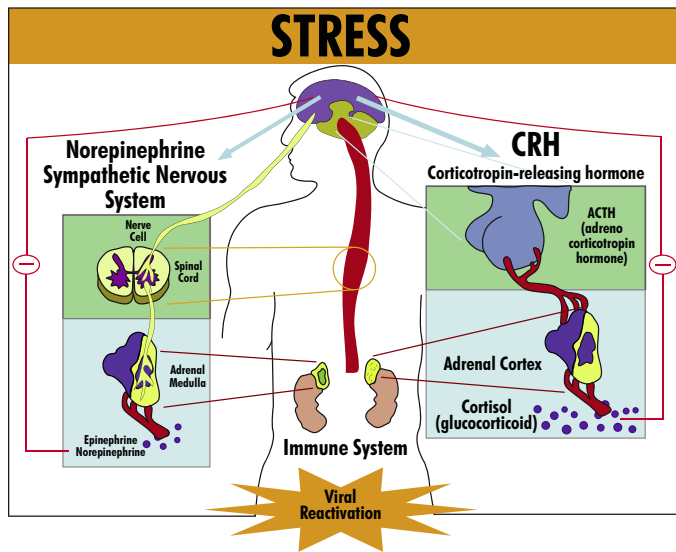
In the past century, industrialization and technology have changed our world, and we are being exposed to a greater variety of stressors daily. We may think that one type of stress is better or worse than another, but in reality, the body interprets and responds to all stress in the same manner: cortisol release. You may have heard cortisol described as the "stress hormone." When the body experiences stress, cortisol is released from the adrenal cortex which activates the "fight-or-flight" mechanism. This mechanism prepares us for self-defense and survival and is intended for short-term bursts of energy and heightened function. Cortisol

causes the release of sugar into the blood so that we have energy to deal with the stress, moves blood away from the organs to the peripheral muscles to be ready to move the body, increases blood pressure by improving the sensitivity of the vessels to adrenaline, decreases bone formation, acts as a diuretic by excreting water, and heightens awareness. Among these effects is suppressed immunity, which opens the door to infection and suppresses inflammation.



Stress and Illness: Understanding the Connection

When we get sick, the fever, stuffy nose, phlegm build-up and swollen lymph nodes are not the result of the infection itself, but rather they are the result of the immune system fighting the infection. Our immune system responds to infection with a flux of white blood cells to the infected area, and it is their activity that causes the symptoms. The inflammatory response to sickness or injury is also the result of the immune system trying to heal the tissues by bringing a flood of plasma (blood), white blood cells and nutrients to the injured area. When stress is present, cortisol is released and our body is primed to deal with the stressor. When cortisol returns to baseline levels, the suppression is removed. This is why we often seem to get sick after a stressful situation has passed, such as after exams, a stressful time at work, family events, and so on. It's not that we've gotten sick, but rather that the immune system is finally responding to the infection.



results when the adrenal cortex has been so overworked through chronic stimulation that the adrenals experience “burn-out” or fatigue, and can no longer produce enough hormones for proper stress response and function.¹⁹ This can lead to chronic fatigue, illness and inflammation, among other things. Fortunately, with proper care, this can be reversible. So how much and what kind of stress causes the release of cortisol? All of it! The body interprets and responds to all stress in the same way: cortisol release. The hypothalamus interprets each stimulus and releases hormones that result in cortisol release in response to any stimulus that an individual perceives as fearful or threatening.

The Importance of Good Nutrition

Nutritional stress includes what we eat and what we don’t eat. Today, we eat less fresh, unadulterated food and consume more processed, preserved foods than ever before. We do not only need calories from food for energy, we need also the vitamins, minerals and phytonutrients that are present in food in just the right amounts so that they can work synergistically to promote health. Food that has been enriched has been stripped of most of its nutritional value through the refining process and only some of it is replaced. Heat and chemical processing may remove or kill many of the nutritional elements that are naturally present in food.¹ When we consume food that has been heavily processed or has little nutritional value, our body may not recognize what we consume as food and will try to expel it from the body quickly. The body will also use nutrients from its own reserves or from other foodstuffs in order to digest it, since the enzymes used to digest food require nutrients, such as minerals, to catalyze reactions.¹⁶ All of this causes stress throughout the body because it is not getting what it needs to function properly. This will eventually lead to the exhaustion of non-primary bodily processes, hormonal imbalances, and disease.^{10,11,16}



Figure 3. An ear of corn contaminated with aflatoxin

Figure 1. Stress can suppress the immune system long enough to allow infections to spread. By the time the immune system can effectively respond, some damage has already been done.

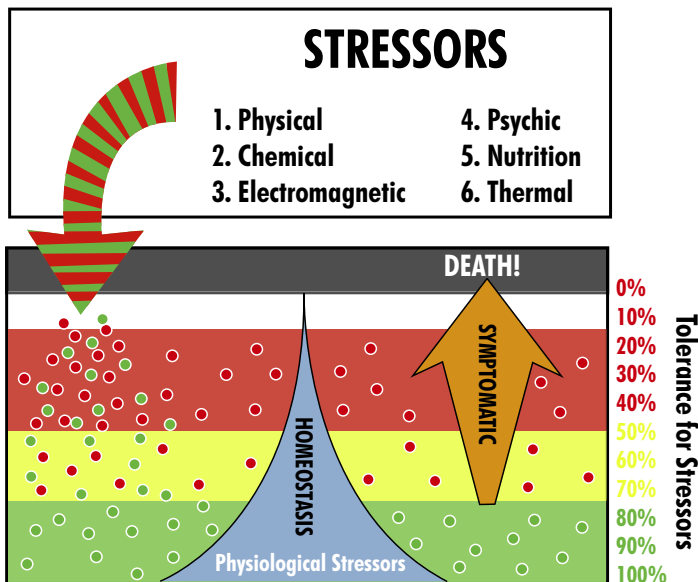


Figure 2. All stressors are funneled together within your body by the nervous system

If stress remains for a lengthy period of time, hypercortisolemia can occur, which is a higher than normal level of cortisol in the blood. This creates a longer period of time during which bone maintenance is diminished, sleep is not restful, tissue repair is slowed, and cells are less sensitive to insulin which causes high blood sugar. In fact, research has shown stress to be related to many of the illnesses that devastate our society, such as mental illness, cancer, autoimmune diseases such as arthritis and fibromyalgia, and heart disease and all its components including high blood pressure, diabetes, dyslipidemia, weight gain, and more. In cases of chronic stress a condition called adrenal insufficiency (also known as adrenal fatigue) may occur. This

The Effect of Toxins and the Environment

Nowadays, chemicals and toxins reach our body through food, drugs, our water supply, in the air, in our cleaning products, and in our merchandise.²³ Many chemicals are toxic to our bodies or they become toxic when present in higher amounts. Toxic residues from pharmaceuticals and personal care products (PPCP) end up in our water supply.¹⁷ If they are toxic in diluted amounts in our water supply, how toxic are they when we ingest, wear or use them? Studies have found that long-term exposure to water pollutants has caused an impaired cortisol response to stress in fish.¹⁹ Additives that give colour, taste and shelf-life to processed foods are poisonous to the body.¹⁶ In smaller amounts, chemicals are known to cause weight gain by altering hormonal balance, which affects immunity.²³ Chemicals such as pesticides and drug residues have also been found in human fat stores, even after cessation of exposure. If these toxins are not cleared out by appropriate detoxification systems, they just sit in fatty tissues and continue to damage cells. It is possible that this accumulation of toxins in the body contributes to the weight gain and diseases we attribute to being part of the “middle-aged metabolism crash” or “a normal part of aging”. Additionally, mold and fungi can accumulate on our food supply due to pesticide use, improper storage, and processing. These can then secrete mycotoxins that are toxic to the body.¹⁴

There are several detoxification systems at work in the body. The immune system plays an important role by generating antioxidants to harness toxins and detoxify the body. The more toxins one is exposed to, the more antioxidants are used up, leaving fewer antioxidants for normal immune processes, such as protecting tissues from pathogens and from inflammation.

Although electromagnetic radiation is not a new phenomenon, the magnitude to which we are exposed to it has greatly increased recently. Electricity now surrounds us, and even if we did not use electrical devices, we would still be exposed to radio and satellite frequencies and electrical fields. Non-ionizing electromagnetic radiation comprises most of our daily exposure; however, we may be exposed to small amounts of ionizing radiation in our daily lives as well as in medical facilities. One study found that exposure to cellular telephone non-ionizing radiation caused a 12% decrease in cortisol levels during a 4-week exposure period.²¹ Another study found that both low and high levels of non-ionizing radiation from TV and radio broadcasting stations caused subjects to secrete higher levels of cortisol.²² Remember that both high and low levels of cortisol can negatively affect immunity. There continues to be controversial evidence related to the health effects of non-ionizing radiation, and its cumulative effects. Due to the multitude of sources we are exposed to daily this is certainly something to be aware of.²

The Role of Physical and Emotional Stress

Physical stress results from physical harm or insufficient repair processes. This can result from a severe injury, injury caused by weak tissues due to malnutrition or a lack of exercise, or due to tissues that have been overworked, overactive, unrested or unrepaired. An example of the latter is too much high intensity exercise, also known in athletics as overtraining (although overtraining is multifaceted), since exercise increases free radical production.¹⁵ Tissue repair processes are slower and may be incomplete when cortisol levels are too high or too low. High levels suppress immunity and repair processes.¹¹ Low levels offer no suppression, which might permit infections to fester or the immune system to become overactive, resulting in tissue damage, inflammation and pain.⁹ High levels of cortisol also diminish the quality and length of our sleep during which repair processes occur and may disturb the natural circadian hormonal balance of metabolic hormones that help maintain a healthy metabolism. In fact, a lack of adequate sleep is recognized as a factor.



Psychological stress, mental stress and emotional stress can all be summarized with one word: thoughts. The nature of our thoughts affects the physical and chemical state of the body.⁷ They are intertwined and inseparable. Negative or destructive thoughts and emotions can cause physical harm to the body.³ Disharmony in the mind produces disharmony in the body, which results in illness and disease. It is said that many heart attacks happen on Monday mornings, and it is surmised that this phenomenon is related to scheduled activities and work.^{4,5} Fibromyalgia and shingles often appear after prolonged periods of stress.^{6,8} The placebo effect is a good example of how thoughts affect the body. One study's results also suggested that obese women tend to have a hyperactive cortisol response to stress.²⁰ This shows that the way in which an individual perceives and responds to stress influences their cortisol release and thus their hormonal balance and metabolism. All of this in turn influences immune factors.

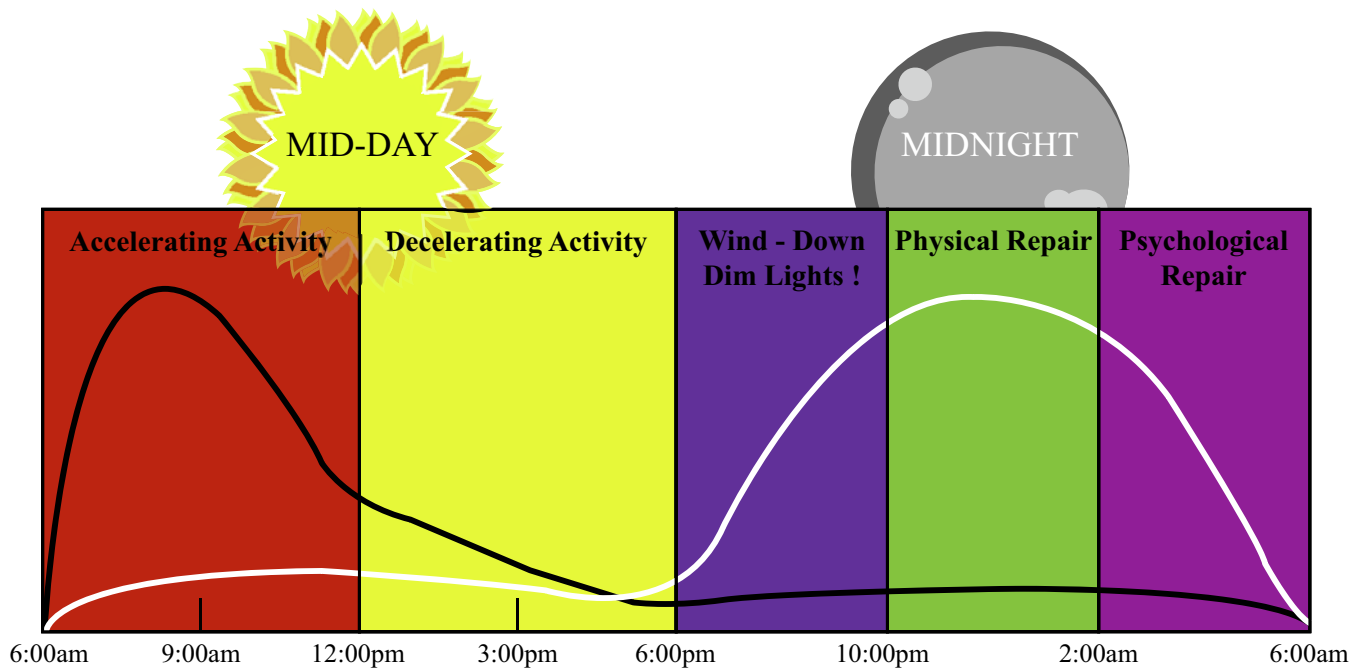


Fig 1. Healthy balance of stress (cortisol) & hormonal cycle.
May vary with seasonal daylight changes.¹⁵

BLACK LINE: cortisol & stress hormones
WHITE LINE: repair hormones

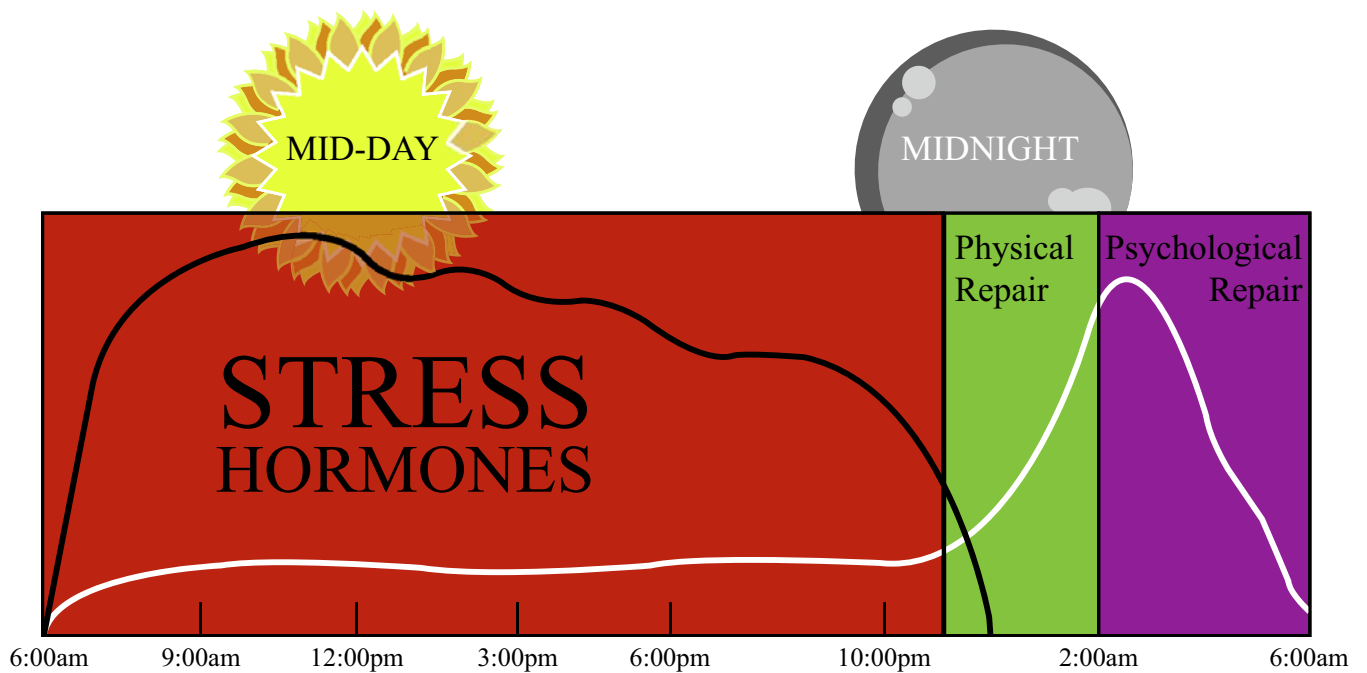


Fig 2. Imbalanced stress (cortisol) & repair hormonal cycle.
Will vary according to lifestyle.¹⁵

BLACK LINE: cortisol & stress hormones
WHITE LINE: repair hormones

Manage Stress, Stay Healthy

Evidently, we are constantly encountering forms of unavoidable stress. Of course, there are ways to reduce stress. The most effective way to reduce stress is to remove or minimize the stressor. If this is not possible, the next best thing is to learn how to manage stressful situations. Behavioural and cognitive strategies, deep breathing, positive thinking, various therapies, keeping adequately hydrated with clean water, eating nutritious foods that are as close to their natural states as possible, taking dietary supplements, getting enough good quality sleep during optimal time periods, relaxing more often, doing enjoyable activities, and getting the right amount of the right kind of exercise are some techniques to manage stress. Managing stress, and hence cortisol release, may cost money, time, or certain lifestyle changes, but does any good thing come without a cost? And the price is worth the benefit!



Take rest; a field that has rested
gives a bountiful crop

Ovid

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Helps detoxify harmful
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- Blocks bacterial and viral growth
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LACTOFERRIN

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- Promotes a healthy gastrointestinal system
- Anti-inflammatory



IMMUNE SUPPORT

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- Enhances the body's immune defenses
- Optimizes immune capacity to help prevent infection



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- Suppresses inflammation
- Reduces the risk of heart failure



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